# Uncertainty quantification and optimization of complex systems: The challenge and promise of model reduction

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Despite sustained advances in computing power, significant challenges remain in achieving optimization of large-scale computational models, such as those resulting from discretization of partial differential equations. Further, for many engineering systems, quantifying and controlling uncertainty is an essential component of achieving improved system performance; however, existing uncertainty quantification and stochastic control approaches are generally computationally intractable for large-scale systems. Model reduction provides an opportunity to generate low-dimensional, efficient models that retain predictive fidelity of high-resolution simulations, thus making tractable the tasks of optimization and uncertainty quantification in the large-scale setting. This talk presents some recent advances and open challenges in model reduction methods.

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